Human Machine : From Interaction to Integration

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AUTHORS VERSION

Forthcoming spatial exploration programs will furthermore amplify the problems of behavior and performance risk mitigation such as the effect of long term missions on motorskills, cognitive functions and their impact on task performance. It imposes us to think a new the interactions between human and automation in the novel context of missions with a great crew autonomy, no resupply and the need to accommodate vehicle/habitat design in function of possibly evolutive mission attributes.

Currently used paradigms in Human-System-Interaction design tend to conceive the human operator as a simple set of constraints upon the artefactual system thus understanding interaction as a passive relation. An answer to this problem can be found by substituting the interactive paradigm by an integrative one. Instead of considering the operator as a set of constraints, a Human-System-Integration paradigm aims to conceive it as a part of the global system which is the artefact in use. This means that the human part of the overall system should possess a similar status than a technical one even if they are not of the same nature at all. "Human machine" (HM) is a concept integrating cyber-physical systems and biological systems. As a scientic challenge, HM is about the conception of a theoretical framework dedicated to human machine integration and its modeling, from epistemology to formal and experimental methods. As a practical challenge, HM is about correct design for enhancement and reliable engineering of human systems integration, from human-machine interaction to sociotechnical system, their behavior and their performances. One notable problem with this approach resides in that of its propensity for reductionism. Reductionism could be seen as the easy way to integration in the sense that it allows ad extremum simplication by means of the hypothesis that human beings are mere machines. Genuine integration could not follow this path because of the inextinguishable specicities of biological objects.

Following these specicities, the purpose of integrativism is the development and provision of an unied framework for human behaviour prediction and control which and its roots in physiology and allows to construct a model of the human individual, from the cellular scale to the social one. In order to achieve this general model of human beingness in a more and more autonomous technical ecosystem it is important to inspect the foundations of behavioural sciences so that the apparatus can be designed to take into account the di erent scales that constitute the complexity of any biological system and furthermore of any Human- Integrated technical one.